



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,501	11/14/2003	Dengzhi Zhang	VWE-004	1016
22888	7590	03/12/2007	EXAMINER	
BEVER HOFFMAN & HARMS, LLP			BLOOM, NATHAN J	
TRI-VALLEY OFFICE			ART UNIT	PAPER NUMBER
1432 CONCANNON BLVD., BLDG. G			2624	
LIVERMORE, CA 94550				
SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE		DELIVERY MODE	
3 MONTHS	03/12/2007		PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/714,501	ZHANG ET AL.	
	Examiner	Art Unit	
	Nathan Bloom	2609	

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on _____.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1,2,7,10-13,15,16,18,19,21-29,31,33-36 and 38-40 is/are rejected.
- 7) Claim(s) 3-6,8,9,14,17,20,30,32 and 37 is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims 11-12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Instant claim 11 further limits the method of claim 10 wherein the frame coding efficiency factor is equal to a frame quality constant divided by frame complexity. Instant claim 12 further limits the method of claim 10 wherein a new value for the frame coding efficiency factor is equal to one minus a coding efficiency coefficient CEC time the current value of frame coding efficiency factor plus the coding efficiency coefficient times a frame quality constant divided by a frame complexity. Values of the frame quality constant, frame complexity, and coding efficiency coefficient are shown in the specification but these terms are not defined and how these values were obtained is not described within the disclosure.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-2, 7, 15-16, 18-19, and 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Uz (US 5682204).

Instant claim 1 encompasses the method of generating a frame quantization parameter for encoding a current frame of an incoming video stream having a plurality of frames, the method comprising the steps of calculating a complexity ratio (a measure of complexity, activity, difficulty of coding when compared to the other frames), using this to calculate a frame bit rate and then adjusting the frame quantization to meet the current frame bit rate. Uz discloses a method of quantization and rate control based on the activity (complexity) in a video sequence. In lines 4-10 of column 13 it is disclosed that the amount of bits distributed to a frame is proportionally distributed between the macroblocks based on the proportion of the total activity that occur within that macroblock. Thus based on each macroblock's ratio or proportion of the activity (complexity ratio) for the given frame the bit budget and hence quantization for that particular portion are determined. Furthermore, instant claim 2 limits the method of claim 1 wherein the calculation of the complexity ratio is done by calculating a local complexity, a global complexity, and setting the ratio equal to the local divided by the global. Based on the disclosure of Uz it is clear to one of ordinary skill in the art that the Local Complexity (activity) is the activity within each macroblock and the Global Complexity (activity) is that which occurs in each frame.

Instant claim 7 further limits the method of claim 1 wherein calculating of a bit balance adjustment factor is performed that is used in calculating the current frame bit rate using the complexity ratio. Uz discloses in lines 31-37 of column 6, lines 44+ of column 12, and lines 1-9 of column 13 that the bit balance is adjusted based on the current cumulative deviation in bit budget. This bit budget is then used to determine how many bits are available for distribution in the frames, and based on this calculation the target bit rate is determined then the current frame bit rate is determined based upon the activity of each frame and macroblock (complexity ratio).

Instant claim 15 further limits the method of claim 1 wherein a step is added for calculating an underflow quantization parameter for each macroblock of the current frame. Instant claim 16 further limits the method of claim 15 wherein the calculation of the underflow quantization parameter for the current frame comprises calculating a maximum macroblock bit budget, tracking the total usage for the current frame, tracking a count number of processed macroblocks, and calculating the underflow quantization parameter based on these. Uz in column 5 lines 14+ discloses the use of virtual buffers to calculate for each macroblock a rate control quantization factor that is based on the underflow or overflow of the bit usage of the previous blocks. The calculation of this parameter is based on the bit budget, the usage, and the number of macroblocks of the current frame thus the quantization can be adjusted for the current and future frames based on the actual bit usage.

Instant claim 18 further limits the method of claim 15 requiring the step of applying an activity mask to generate a macroblock quantization parameter using the underflow quantization parameter. Uz discloses in lines 20-27 of column 5 the use of the activity mask to adjust the rate control factor (underflow quantization parameter).

The limitations of instant claims 19 and 21-23 have been previously rejected as per rejection of instant claims 1, 15-16, and 18.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uz in further view of Golin (US 5265180).

Instant claim 10 further limits the method of claim 1 wherein a frame coding efficiency factor is calculated. Uz doesn't disclose a frame coding efficiency factor, but Golin in lines 60+ of column 2 teaches the calculation of $T[n+1]$ which controls the compression of the next frame dependent on the complexity ratio and the efficiency $T[n]$ of the previously coded frame. It would have been obvious to combine the teachings of Golin and Uz because both teach VBR adjustment in which the quantization is varied based on frame complexity. This combination allows for the adjustment of the quantization and bit rate based on the coding efficiency of previous frames.

Instant claim 13 further limits the method of claim 10, wherein the calculation of the frame quantization parameter based on the current frame bit rate comprises calculating a bit budget for the current frame using the current frame bit rate, calculating an average macroblock

quantization factor of a previous frame, wherein the previous frame and the current frame have a same frame type, and calculating the frame quantization parameter using the bit budget, the average macroblock quantization factor of the previous frame, and a bit usage of the previous frame. Uz discloses in lines 64+ of column 4 and lines 1-14 of column 5 using the quantization and number of bits used to code the previous frame. Furthermore, Uz divides the calculated bit budget for the current frame to each of the macroblocks based on the complexity (activity) of each block. Given that Uz considers it necessary to adjust the quantization factor for each macroblock and that Uz has already taught the calculation of the bit budget based on previous frame of the same type then it would have been obvious to one of ordinary skill in the art to apply this known method to each macroblock within the frame so as to efficiently distribute the bit budget within the frame.

5. Claims 1, 24-29, 31, 33-36, and 38-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uz.

Instant claims 24-29, 31, and 33-36, and 38-40 claim the apparatus that performs the method of instant claims 1-2, 7, 10, 15, 19-20, and 22-23. As per the previous rejections of instant claims 1-2, 7, 10, 15, 19-20, and 22-23 Uz has disclosed the method and at the time of the invention it was known by one of ordinary skill in the art how to use a PC and write software so as to perform the method of claim 1. Furthermore, the components for performing these methods can be seen in the block diagrams 1A-1B and 7A-7B provided by Uz.

Allowable Subject Matter

6. Claims 3-6, 8-9, 17, 20, 30, 32, 34, and 37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Instant claims 3 and 30 further limits the method/apparatus of claim 2 and 28 wherein the calculation of the local complexity comprises calculating a new average local complexity, and then calculating a new value for the local complexity as a weighted average of a current value of the local complexity and the new average local complexity. Golin (US 5265180) recites the use of an average local complexity over frames but the art cited for rejection of instant claim 1 uses local complexity as a term for the individual macroblocks and thus does not apply.

Instant claim 4 further limits the method of claim 3 wherein the new average local complexity is equal to a weighted average of a plurality of frame complexities weighted by a plurality of frame types. The use of weighting the complexity by type of frame is known, but not the use of a weighted average.

Claim 5 requires that the global complexity is a long term average of the local complexity. Uz only teaches a spatial relationship between global and local complexity.

Instant claim 6 requires that the global complexity be a temporal average instead of a spatial average as described by Uz.

Instant claims 8 and 32 require that the bit balance be divided by a duration to obtain the adjustment factor and the prior art only teaches the generation of the bit balance adjustment factor without being divided by a particular duration. Uz does not teach the division or adjustment of the bit balance adjustment factor by dividing by duration.

Instant claim 9 further limits the method of claim 7, wherein the current frame bit rate is equal to the bit balance adjustment value plus a rate control parameter multiplied by the complexity ratio C_RATIO multiplied by a frame target rate plus the frame target rate multiplied by the difference between one and the rat control parameter. The known prior art does not disclose the equation listed in claim 9 for generating the current frame bit rate.

Instant claim 14 teaches an equation for calculation of the frame quantization parameter that is not stated in the known prior art.

Instant claims 17, 20, and 37 teach a specific equation for calculation of the underflow quantization parameter that is not disclosed in the known prior art.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ribas-Corbera et al (US 6111991) discloses a method of using VBR encoding wherein the quantization is done on each macroblock based on a target bit rate, total number of bits available, and the total distortion (minimize distortion). See figures 2-3, 6, and columns 3-6.

Chang et al (US 2004/0234142) discloses the use of a complexity ratio in the calculation of a quantization parameter for use in VBR encoding. See figures 3-5 and the complexity measure on pages 2 and 3.

Gao et al (US 2006/0088099) discloses a VBR encoding method based on Rate-Distortion optimization wherein a global complexity is calculated and a measure of activity (complexity) of the different frame types in a GOP is determined. See paragraphs 0003-0040.

Reese et al (US 5832125) discloses a VBR encoding method based on long term and short term performance of the previously encoded frames. See figures 1-2 and columns 2-3.

Yokoyama (US 6763138) discloses a VBR encoding method wherein the average complexity is determined and the quantization is adjusted but no complexity ratio is used. See figures 1-9.

Contact Information

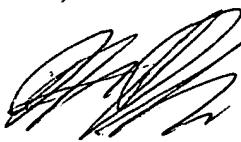
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan Bloom whose telephone number is 571-272-9321. The examiner can normally be reached on Monday through Thursday from 7:30 am to 5:00 pm (EST). The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jeffrey Stucker, can be reached on 571-272-0911. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

01/09/2007

Nathan Bloom



03/05/2007


JEFFREY STUCKER
SUPERVISORY PATENT EXAMINER